REMARKS

Claims 1 - 26 remain active in this application. The indication of allowability of the subject matter of claims 5 - 11, 13 - 15 and 25 - 26 is noted with appreciation. Amendment of claims 1, 16, 19 and 22 has been requested to further emphasize novel aspects of the invention. Claims 3, 18, 21 and 24 have been rewritten in independent form including the amendments requested in claims 1, 16, 19 and 21. Support for the amendatory language (verbatim for claims 16, 19 and 21) is found at least at page 4, lines 4 - 6, of the specification as originally filed. No new matter has been introduced into the application.

Claims 1, 3 - 4, 16, 18 - 19, 21 - 22 and 24 have been rejected under 35 U.S.C. §102 as being anticipated by Cao, claims 2, 17, 20 and 23 have been rejected under 35 U.S.C. §103 as being unpatentable over Cao and claim 12 has been rejected under 35 U.S.C. §103 as being unpatentable over Cao et al. (The rejection of claim 12 was previously grouped with the rejection of claims 2, 17, 20 and 23. If this is, indeed a new ground of rejection, it is not identified as such in the present final action and certainly was not necessitated by amendment. Accordingly, it is respectfully submitted that the finality of the present action is premature.) These grounds of rejection are respectfully traversed for the reasons of record and the further remarks provided below.

Initially, it is noted that the Examiner now relies upon the embodiment of Figure 14 of Cao; indicating that the previously submitted remarks were, in fact, persuasive in regard to the embodiment of Figure 1 of Cao. While the embodiment of Figure 14, of Cao includes some features similar to that of the invention, the principles of the invention are very different from that of Cao and those features of Cao

common to the invention are respectfully submitted to be largely incidental (or coincidental) while Cao does not, in fact, answer explicit recitations of the claims and cannot be properly modified to do so since any such modification would prevent the functioning of the arrangement of Cao in the intended manner. (See In re Gordon, 221 USPQ 1125 (Fed. Circ., 1984).) However, it is respectfully submitted that, on page 15 of the response filed December 19, 2003, the embodiment of Figure 14 was, in fact, argued and demonstrated to be deficient to answer the claim recitations in the same manner as the embodiment of Figure 1 of Cao. That is, while the embodiment of Figure 14 provides for the respective communication wavelengths to counter-propagate in opposite directions in the erbium-doped fiber (EDF) 1406 which is used for a *discrete* amplifier rather than a *distributed* amplifier, it is not at all clear that separate optical fibers are not required for transmission outside the amplifier. Note that column 19, lines 26 - 36 indicate that Figure 14 is a composite or superposition of the arrangements discussed in regard to Figures 12 and 13 (Figures 12A - 12D and 13A - 13D) which are confined to a single direction of transmission over an optical *transmission* medium. Further, such an application of Cao to the claimed subject matter (rather than reading the explicit recitations of the claims on subject matter disclosed in Cao) glosses over the basic effect of the invention in regard to *distributed* compensation for the *distributed* effect of markedly different *attenuation* of the respective wavelengths when transmitted through the *same* optical fiber (which Cao does not recognize and which may not even be possible in the arrangement of Cao if different optical fibers are required for transmission outside the discrete amplifier of Cao) as distinct from the general amplification function of a discrete amplifier in Cao.

The application of Cao to the claimed subject matter which the Examiner asserts also glosses over the difference of amplification mechanism between the invention, as claimed, and the arrangement of Cao. It should be noted in this regard that the pump laser wavelength for an EDF amplifier (EDFA) must be of a specific wavelength in order to induce fluorescence in the EDF to cause amplification (and then only over a narrow amplification bandwidth of about 40 nm "near 1500 nm", far less than the wide wavelength separation of 100 nm or more of communication bands to which the invention is applicable as recited in claims 3, 18, 21 and 24, now rewritten in independent form) and, by the same token, the relative direction of transmission of the pump laser radiation and the communication signal is substantially irrelevant to the operation of the EDFA. See column 2, lines 34 - 58. Note also that the "blue" wavelength band can be shorter (e.g. 1.3 μm, noted at column 3, line 52) than the pump laser wavelength (e.g. 1480 nm, noted at column 2, line 39). Thus, in summary, both the relative directions of communication and pump light and the respective wavelengths of communication signals and the pump light are substantially irrelevant to the operation of an EDFA such as that of Cao but are both significant to the performance of "compensation" for the markedly different attenuation of energy of different wavelength bands when transmitted through the same fiber while providing additional and similar amplification to both communications band wavelengths.

More specifically, the invention is directed to a substantially different arrangement in which the relatively longer and shorter wavelength bands are attenuated in an optical transmission medium in markedly different degrees due to transfer of energy from the shorter wavelength signal to the longer wavelength signal. This effect occurs in proportion to

the intensity of the longer wavelength light and may be conceptualized as the shorter wavelength light providing a "pump" for *distributed* amplification of the longer wavelength light; causing markedly increased attenuation of the shorter wavelength light. The invention seeks to provide "*compensation*" for this effect (as well as similar amplification for both wavelength bands - see Figure 1C) by providing excitation light of a shorter wavelength than the shorter or shortest of the communication band wavelengths and propagating in a direction opposite to the signal to be compensated and the same direction as the signal which is attenuated less. The opposition of propagation directions of the shorter wavelength band and the excitation light provides reduced amplification near the input end of the optical transmission medium for the signal to be compensated (in order to reduce distortion) and progressively more compensation toward the exit end of the optical transmission medium for the signal to be compensated where the excitation signal is introduced (in order to maintain a low signal to noise ratio); thus solving these problems in providing compensation which was not previously available in the art by applying excitation light in a counterintuitive manner to engender both distributed compensation and amplification through the same physical mechanism which initially caused attenuation of the respective wavelengths to be markedly different. See, for example, page 4, line 23 to page 5, line 14. At the same time, the amplification achieved by the invention is unexpectedly made similar for the respective bands even when widely separated by 100 nm or more and notwithstanding a signal strength dependence of the effect over the optical fiber length and is also unexpectedly applicable to more than two communications bands, as the Examiner has evidently recognized by indication of allowability of claims.

Cao does not recognize the effect of markedly different attenuation due to different counter-propagating wavelengths or the problems of compensation, much less providing a solution thereto, as the Examiner appears to realize but which the Examiner dismisses since "Cao meets the structural limitations of the claims as presented." However, it is respectfully submitted that Cao does not, in fact, *teach* the relationships of the communication wavelength bands and the wavelength of the excitation light in regard to relative wavelengths and propagation directions or any beneficial effect to be derived from particular relationships thereof which are recited in the claims. The relative wavelengths, to the extent they may answer the claim recitations are coincidental and wavelengths contrary to the invention are also disclosed. In any case, the amplification in Cao is not performed such that "energy of said first wavelength-multiplexing light is *compensated for energy transfer from said first wavelength-multiplexing light to said second wavelength-multiplexing light*" (claims 16, 19 and 21, emphasis added) or to compensate for "increased attenuation of the energy of said first wavelength-multiplexing light and reduced attenuation of the energy of the second multiplexing light (claim 1) or the corresponding recitations of those claims as finally rejected.

Therefore, it is respectfully submitted that Cao does not, in fact, anticipate any claim in the application or provide evidence of a level of ordinary skill in the art which would support a conclusion of obviousness of the subject matter of any claim in the application. In fact, Cao largely teaches away from the present invention by indicating substantial indifference to the relative directions of the communication signals and the pump light; using tow lasers propagating light in opposite directions for

more or less equally amplifying the signal light of two bands whereas the present invention may use one (or more, for example, if more bands are to be compensated or a different compensation function over the optical fiber is to be derived) pump laser propagating light in at least one specific direction relative to the respective communication signal propagation directions to provide equalized (e.g. compensated and similarly amplified) effect on all communication signal bands. Therefore, by glossing over the function recited and the effect compensated, the description of which is expanded in the claims by the above amendment, by seeking to apply a discrete amplifier arrangement such as Cao to the claimed subject matter, it is respectfully submitted that the Examiner has not made a *prima facie* demonstration of anticipation or obviousness of any claim in the application and that the stated grounds of rejection are in error and untenable. Accordingly, reconsideration and withdrawal of the stated grounds of rejection is respectfully requested.

It is also respectfully submitted that entry of the above-requested amendments is well-justified. In addition to the possible prematurity of the finality of the present action noted above, it is also submitted that no action can properly be made final without making a *prima facie* demonstration of the propriety of the grounds of rejection contained therein. Further, the above amendments should be entered since they cannot raise any new issue not presented by the language of the claims as finally rejected (since the requested amendments are confined to matters of emphasis in description of "Raman scattering" while they clearly place the application in condition for allowance or better form for appeal by materially reducing and simplifying issues. Therefore, entry of the above amendments is respectfully requested.

Since all rejections, objections and requirements contained in the outstanding official action have been fully answered and shown to be in error and/or inapplicable to the present claims, it is respectfully submitted that reconsideration is now in order under the provisions of 37 C.F.R. §1.111(b) and such reconsideration is respectfully requested. Upon reconsideration, it is also respectfully submitted that this application is in condition for allowance and such action is therefore respectfully requested.

If an extension of time is required for this response to be considered as being timely filed, a conditional petition is hereby made for such extension of time. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 50-2041.

Respectfully submitted,

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